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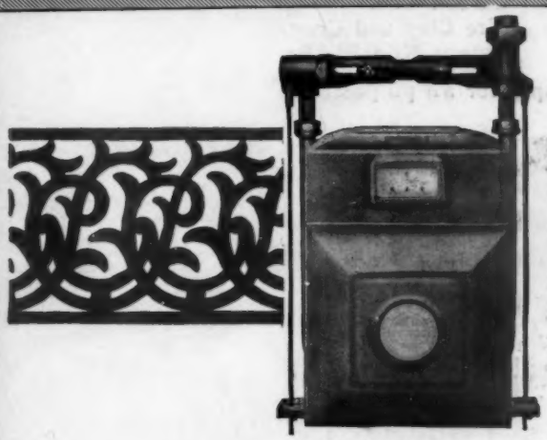

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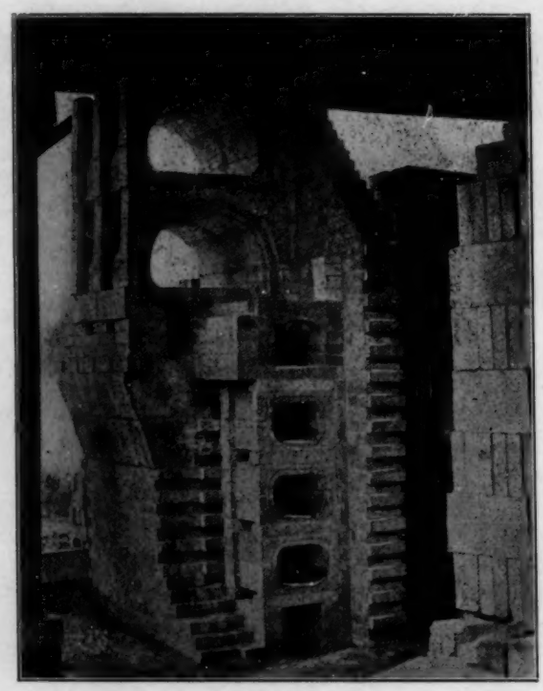

Photograph of a half section of our Recuperator and Furnace Arch. Entire weight of retorts is being carried on furnace and recuperator walls. Note absence of furnace arch key and two-piece construction of recuperators.

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SIXTY-SIXTH YEAR

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The Battle for Heating Business*

What competition gas must meet and what must be done to meet it

Henry O. Loebell

Vice-President, Combustion Utilities Company

I HAVE been assigned the subject of "Competition." Wherever we find two or more men, industries, or organizations working for a common market, we find this element; this striving toward a common goal is the very essence of competition. Thus gas as a fuel naturally must enter into competition with any other fuel—coal, fuel oil, electricity, wood—anything that burns.

What are the factors determining the trend of competition of these various fuels, is the next question. If securing heating energy were the sole aim in the utilization of fuel, then the fuel which is found to be most economic would be the most advantageous. This is true in operations, such as boilers of large size, where coal is always used because it is the cheapest.

But an analysis of the factors outside of just heat content which determine the value of a fuel, boil the situation down to two great fundamental requirements—first, the fuel must satisfy the desire for greater and greater comfort in the home; second, the fuel must be adaptable and flexible enough to meet modern methods of production in the factory.

Satisfying the First Essential

The gas industry has apparently been successful in satisfying this first requirement as it is carrying the major portion of the domestic load. However the oil company, the coal company or the electric company would have no trouble in securing this load if they were to give exactly the same service from the standpoints of cleanliness and convenience at a price the consumer is willing to pay. In fact, the electric company is already taking on a good part of this load now. It is estimated that they have about 200,000 electric ranges, 50,000 or 60,000 water heaters and something like 1,000,000 air heaters in use today.

House Heat With Oil

Just a few words about house heating with oil. As gas men we have always looked upon the oil business as being something we don't even want to think about; it is beneath us, means nothing to us, because it is an inefficient fuel. We have never stopped to think that the reason for this is because oil men have allowed it to be so. Gas is an efficient fuel because gas men have made it so; and electricity is more efficient because the electric people have made it so. In other words, the reason why we have never looked upon oil seriously as a competitor is simply because there has never been the proper research, engineering and development behind it to make it economical, efficient, adaptable and desirable as a fuel.

Conditions in Industrial Field

In the industrial field we have somewhat similar conditions to face. The gas man must realize that, while gas as a fuel from the standpoint of energy cost alone is more expensive than fuel oil, and lower in cost than electricity, he competes more successfully with oil than he does with electricity. Let us see why this is so.

The industries of today are passing from the stage of an art to that of a science. The manufacturer no longer depends on the skill and word of the mechanic; he sends his problem to the laboratory, which in turn makes an analysis of it, determining to the last degree the physical and chemical characteristics that must be observed in the particular manufacturing process under consideration. This is the scientific method.

*Read at Mid-Winter Conference of A. G. A. in San Francisco.

Two Fuels Available

A close analysis of this situation reveals the fact that there are really only two fuels available to the manufacturer with which he can interpret the advancement of science from his research laboratories in the light of actual production practices. The people who are responsible for carrying on quantity production will immediately rebel if they are forced to obey the orders of the Research Division and follow out the scientific operation of furnaces as developed there, and are not given a fuel to work with which can be controlled.

Oil, while flexible in a great many ways, is limited in that no apparatus has been produced as yet with which you can control its temperature accurately, and, therefore, it has always been used most extensively for rough work which does not require any such refinement in operation. Gas, on the other hand, has been developed to a point of high control, which is the reason why we have been able to make so much progress with it in industry and are in a position to compete with oil successfully.

How the Electric Man Meets the Problem

Now, the electric man has realized all this and knowing that he has no change whatever from the standpoint of production cost, he studies the problem from the standpoint of creating a condition in the workshop which will imitate as closely as possible the condition in the laboratory, and thus eliminate the difficulties of spoilage, etc., and bring about the same results as were obtained in the laboratory where scientific methods were employed.

Consequently, he is getting away with murder and we are allowing him to do it, because, while we have a fuel that can be produced more economically, we have not developed apparatus that will use this gas efficiently and satisfactorily from the standpoint of quantity and quality production.

What Are We to Do About It?

Now, what are we going to do about it? Can we make progress if a situation like this is allowed to exist? Something must be done immediately if we are to take advantage of the opportunities that are waiting just around the corner for us. And the first step I think should be to do some work along the line of developing equipment that will burn gas economically and efficiently, and that will also give the quality production the manufacturers want.

Many people will say to this, "All right, get a manufacturer to do it." That is where the rub comes in. There is no General Electric Company or Westinghouse Company in the gas business, and I make the statement, without fear of contradiction, that there never was a manufacturer of industrial appliances who ever made any money in his country by selling industrial gas appliances to gas companies alone.

The Manufacturers of Industrial Equipment

If you will examine the industrial gas manufacturers in this country, you will find that they fall into four groups. Group one makes one appliance and sells it at a profit because he has no overhead to speak of; what he has is substantially a tin shop, a foundry or a machine shop. He does not suppl any kind of engineering service.

The next group of manufacturers handles industrial appliances as a side line. He may manufacture metal parts, stoves, or anything else. He goes ahead and builds some candy furnaces, some ring burners or oven furnaces, and then when a man buys a carload or so of any one of these, he will say, "Don't you want a couple of candy furnace bake ovens?" "Sure," the purchaser will say, and he buys that. This kind of manufacturer never gives you service, either.

In the third group we find those manufacturers who have worked out systems of combustion which can be applied to a certain number of heating operations. They do not make equipment other than gas-mixing machines, which to a large extent limits their field of application, but nevertheless they have a sufficiently large number of problems to handle to justify the gas company giving them more patronage.

Those That Look Into the Future

Then the fourth class is made up of the manufacturers who are attempting not only to supply the entire field of combustion equipment, but aim to develop new equipment which will enable them to secure all the business in the locality in which they operate. This group, with the preceding group carry the brunt of all the expenses that are incurred in solving the problems of the gas company As soon as a problem presents itself to the gas company which cannot be solved by any piece of equipment on the market, they are called upon, and the number of inquiries that are received in this way are so large and he actual business secured from this source so insignificant that the engineering and research expenses incurred become a burden on them.

The only answer I can see to this situation is that the gas companies give these manufacturers the patronage that is at present going to the first two groups. In this way they can secure the profit that comes from the sale of standard equipment, where research and engineering expenses are not necessary, and apply this to additional research on new types of equipment. One thing is certain—without continuel refinements in the industrial equipment of today, without additional development of new equipment for burning gas, the industrial load is going to gradually slip away from us and some day we are going to wake up and find most of it out of our reach.

(Continued on page 216)

Oil--The Gas Man's Next Problem*

An exposition and analysis of its present and future status

William M. Carpenter

Engineer, Empire State Gas and Electric Association

UPON the future price and supply of fuel there rests not only the economic fortunes of the United States, but also the entire course of the so-called "industrial civilization" of the world.

Oil is a fuel of outstanding importance, industrially, socially and politically. So are its two great products—gasoline and fuel oil. It is for the purpose of making an estimate of their probable availability that this study has been prepared.

The Oil Situation

The two most pressing questions which confront the consumers at the present time in regard to oil are, first, to what extent will the price of their oil probably increase and second, how can this situation be met?

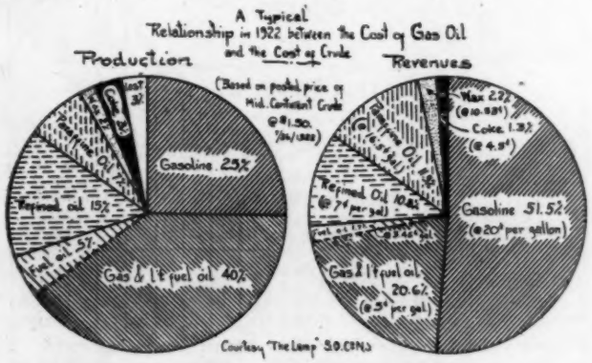


Fig. 1—Cost of Gas Oil and Cost of Crude

The subject immediately divides itself into two major studies:

1. The distribution of the various products of petroleum and their relation to each other; and
2. The problem of the continuation of future supplies of the crude.

Each of these will be taken up in order.

1. The Effect of the Automobile

Before attempting to prophesy the future, let us see just why gas-oil has been so cheap in the past. It all comes back to the tremendous growth of the automobile and its insatiable demand for gasoline. In order to provide sufficient motor fuel, gas-oil, the by-product of its manufacture, has been dumped on the market to bring any return that it can.

Gasoline, kerosene, gas-oil and fuel-oil are distillation products from crude petroleum. While gasoline (except for that recovered from natural gas) was formerly made entirely by the fractional distillation, it is now becoming more and more the result of the destructive distillation of crude and of some of its products, or "cracking," as it is technically termed. This process consists in the application of heat and pressure whereby the heavier oils are broken up to a greater or less degree into lighter constituents. Formerly gas-oil and fuel oil were more or less unavoidable by-products from the manufacture of gasoline; the greater the demand for gasoline, the more gas-oil went on the market. The result of this was that gas-oil sold, up to a short time ago, at a lower price than the crude petroleum from which it was made.

Relation Between Petroleum Distillates

The Figure 1 shows a typical instance of this strange relationship. One hundred gallons of crude petroleum, refined to meet market requirements, yielded 25 gallons of gasoline; 15 gallons of refined oil; 7 gallons of paraffine oil; 2 gallons of wax oil; 40 gallons of gas-oil; 5 gallons of fuel oil; the coke equivalent of 3 gallons; and lost 3 gallons in the process. But as the demand for gasoline necessitated the manufacture of a surplus of other products which had to find a market, these, because of their over-production, inevitably sold at less than cost. The 5 per cent yield of fuel oil returned only 1.7 per cent of the cost of the crude and the 40 per cent yield of gas-oil only 26.0 per cent. Thus the gas-oil was actually selling at less than half what it really should and fuel oil at less than one-third.

A comparison between the supply and demand of gas-oil and fuel oil since the war shows to what lengths the refiners have had to go to move this material.

The Demand for Gasoline

The driving power behind the demand for gasoline, with its resultant surplus of fuel oil, is, of course, the automobile. The phenomental growth of the automotive industry has been the outstanding achievement of the American business world. This is shown in Figure 2. There is as yet little sign of any let-up in the curve of registered cars—let alone any hint of the much-discussed "saturation point."

*Delivered at the semi-annual meeting of the Empire State Gas Association.

Such a point there undoubtedly is—there never existed anything since the world began that did not stop growing some time—but inasmuch as this appears to be at least several years off, its existence can be ignored insofar as this study is concerned.

Assuming a continuation of the growth of the past three years in automobiles, we may expect a registration of over twenty million cars in 1925; twenty-three million in 1926 and twenty-five million in 1927. This is far enough ahead for our study; as in 1925 this will necessitate the production of ten billion gallons of gasoline; in 1926 of eleven and one-half billions and in 1927 of twelve and one-half billions. Where is this flood of motor fuel to come from? In the past it has come principally from crude oil; from now on it will come more and more from products which otherwise would be marketed as gas and fuel oil. The "by-product" phase of gas-oil is very nearly over; in the future it will have to stand on its own merits in competition with other fuels.

Table 1

Prices and Reserves of Gas and Fuel Oil

(From Yearbook of the U. S. Dep't. of Commerce, 1924, from U. S. Geological Survey)

	Millions of Gallons			Av. Price $ per Bbl.	
Year	Domestic demand	Stocks in storage at end of year	Ratio stocks demand	G. & F. at refinery	Crude at the well
1918	5,996	659	11.0%	2.01	2.22
1919	6,880	714	10.3%	1.59	2.25
1920	7,811	837	10.7%	2.79	3.44
1921	8.218	1,331	16.2%	1.30	1.86
1922	10,080	1,305	12.9%	1.24	1.78
1923	10,978	1,515	13.8%	1.20	1.71
1924	(12,150)	1,671	(13.8%)	(1.20)	...

The Influence of the "Cracking" Process

In 1914, the average gasoline yield from the crude was 18½ per cent. Since then the yield has been steadily increasing; of late years with great rapidity. The incessant demand for motor fuel has given a tremendous impetus to the "cracking" process; with the result that there are at present some 2,500 of these "cracking" units in operation, and its technique has been so perfected that last year the average yield of gasoline had risen to 33 per cent of all the crude originally run through the stills.

Reduced to its simplest terms, the last column, showing the relation between the production of gasoline and fuel oil, tells the story. As compared with six years ago, the same amount of gasoline is now made with only two-thirds of the crude, and with the necessity of throwing on the market only two-thirds of the amount of fuel oil.

Estimated Productions

Continuing this table for three years and always bearing in mind the inordinate demand for gasoline,

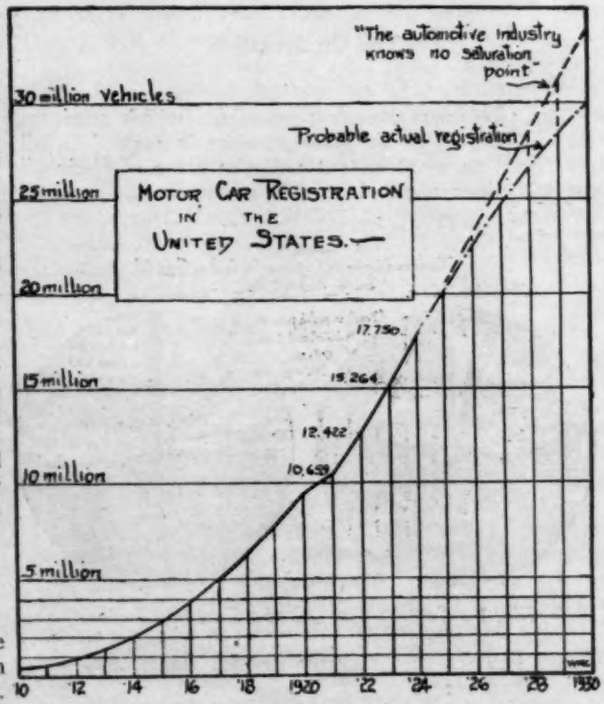


Fig. 2—The American Motor Car Registration

(Continued on page 213)

Table 2

Production of Refined Petroleum Products

	Millions of Gallons Crude Petroleum			Ultimate Yield Gasoline		Fuel Oil		Other Oils		Ratio Ultimate Product Prod. to
Year	Total*	Run to stills	%	Gals.	% runs	Gals.	% runs	Gals.	% runs	F.O. prod.
1918	17,310	13,700	79	3,570	26.1	7,321	53.5	2,666	19.5	48.8
1919	17,640	15,190	86	3,958	26.1	7,627	50.2	3,189	21.0	51.9
1920	22,300	18,400	82½	4,883	26.5	8,861	48.1	3,367	18.3	55.1
1921	22,100	18,700	85	5,154	27.5	9,664	51.6	2,823	15.1	53.3
1922	24,840	21,840	88	6,202	28.4	10,706	49.0	3,285	15.1	58.0
1923	29,860	24,900	83½	7,556	30.3	12,074	48.5	3,446	13.9	62.6
1924	31,000	27,050	87	8,960	33.1	13,460	49.5	(2,750)	(10.2)	66.

Note: *Domestic production, plus imports, less exports, plus or minus the decrease or increase in stocks on hand.

GAS MERCHANDISING

Domestic – Industrial

Ideas for the Man Who Sells

William H. Matlack

KNOWLEDGE

KNOW thy merchandise.

Many folks fail to sign the dotted line for the simple reason that, while advertising attracted them, aroused their interest and created a desire in their mind for the merchandise, when they went to the store to complete the sale the salesman whom they were unfortunate enough to encounter did not "know his stuff." One sales manager that we know insists that no person be permitted to serve a customer until, as he puts it, "he knows his book," which he says means that "the men who approach our customers must know our line of merchandise from soup to nuts, and, not only that, but they must

know what we mean when we say we are selling gas service." It surely peeves me to walk into a gas company store and have one of the men on the floor approach me and say, "What's yours?" and when I say, "Oh, I am just looking at these heaters," to have him drape himself over one of them and say, "Well, how's this one for three-fifty?" when I walked over to one that looks like seventy-five.

"Knowing your stuff" also means that you are not afraid of its price.

People are not wearing many two-bit socks these days and they are not buying many cookers or hot plates, which it takes just as long to sell as a regular range with all the newest attachments.

SELLING BY ANALYZING FIRST

THERE are books, pamphlets, courses and discourses without number on salesmanship. Rightly taken, in small doses, there is no doubt but what any one with average intellect who has mastered the three Rs can derive much benefit from them. Yet it seems to us that there are no cut and dried rules for salesmanship, but that there is a thing called FAITH that makes sales. Faith in the article, in oneself and in the firm.

When a man loses FAITH in any one of these things, his sales record will show it.

The salesman should watch for these symptoms, be honest with himself, and when he begins to get lukewarm in his work, when his enthusiasm begins to wane, he should get a change of scenery, get away from himself and "read the book."

"Reading the Book"

"Reading the book" will always help, for it will get you away from yourself. Self saturation tears down, and what the successful salesman must be, if anything, is a builder. He must believe in building well. He must be tempered with understanding of customers' needs and show a willingness to serve. He cannot do this if he does not have faith.

The successful salesman in any line is the man who caters to the fundamental needs of others. He is the fellow who goes to his customers with the glow of enthusiasm, with the spirit of helpfulness. He has been schooled to sell service.

The man whose market is that greatest institution in the world, the American Home, should get this picture by a study of his own home. Picture the labor-saving devices of industry, in comparison with the home. Jot them down! Look about you! Where is there a home that does not need and want one of your appliances?

Make a Survey of the Average Home

In selling gas appliances, take the average home as your base. Make a survey of the average home.

The average home has five rooms. There are four and one-half people sheltered there. They

cook, sew, sweep, wash, mend, iron, eat, read and sleep there, besides a thousand other things. They use artificial light. They must have fuel for cooking, heating water, heating space, for ironing and washing. They must have hot water for washing bathing, scrubbing and cooking.

There is your market. In some place in that institution there is need for gas.

The potential market is the number of homes in the city served by the gas company, plus the individual needs for better home management. The point of saturation need be given no thought, for as people develop, better housekeeping, better and different appliances will be developed.

If you have faith and are willing to sit down and read the book and look about you, you can in fair times and foul sell your product. Such an analysis may be made of industry as well. Take distinct industries one at a time and apply this analysis. You will be surprised at the possibilities.

USE OF STICKERS TO PROMOTE USE OF GAS

GAS bill stickers have been used for many years to advertise gas appliance and gas service, and the writer has been told by some of the best appliance merchandisers that this form of advertising is very productive and at the same time inexpensive. J. J. Burns, superintendent of domestic sales, Laclede Gas Light Company, St. Louis, one of the most aggressive merchandisers in the gas industry, has used gas bill stickers for years and is still using them.

The Gas Light Company, Augusta, Georgia, has gone a step farther in the use of stickers, as will be seen from the accompanying reproductions. They are using stickers to promote the use of gas by having some tested recipes printed for this use. The recipes are furnished by Miss Cephalie Lewis, who has charge of the Home Service Work done by the company. For several years during the preholiday season the gas company has printed Miss Lewis' recipe for fruit cake in the daily papers. This was made necessary by the many requests by phone that have always come in just before the holiday season. In checking up these requests it was found that the same people in a great many instances made requests each year, saying, "we have lost the recipe we had last year." This year, to forestall this and to insure against loss, the recipes have been printed in the form of stickers in order that they may be pasted in cook books.

After the fruit cake recipe was written, it decided to have other wanted recipes of Miss Lewis' printed in the same form. These, together, with some of the other gas bill stickers, are shown on the illustration.

INDUSTRIAL GAS LESSONS

IF IT'S DONE WITH HEAT — YOU CAN DO IT BETTER WITH GAS

Lesson No. 60

Change of State *(continued)*

House Heating Problem

THE following problem is given for solution. A building contains 25,000 cubic feet of space and is heated by a hot water system. If the air is assumed to change eight times per hour, how many pounds of water per hour must be circulated if the drop in temperature of the water is from 200 to 180 degrees F., and if the temperature of the outside air is 25 degrees F., while that of the air within the room is 60 degrees F.? In this problem the heat loss by conduction through the walls is neglected. (This is, of course, a very appreciable figure, which will be discussed in later lessons under house heating.)

The problem states that the air in the building is changed eight times every hour. This means that 8 × 25,000, or 200,000 cubic feet of air are heated up from 25 to 60 degrees F. each hour. The heat that is required for this must come from the hot water, and as the temperature of the hot water is not to drop any lower than from 200 to 180 degrees F., or 20 degrees F., it follows that the quantity of water required will be the heat necessary to raise the aforementioned quantity of air 35 degrees F. divided by 20. In other words, the equation will read somewhat as follows:

Quantity of water × 20 = Heat required to heat 200,000 cubic feet of air from 25 to 60 degrees F.

The Solution

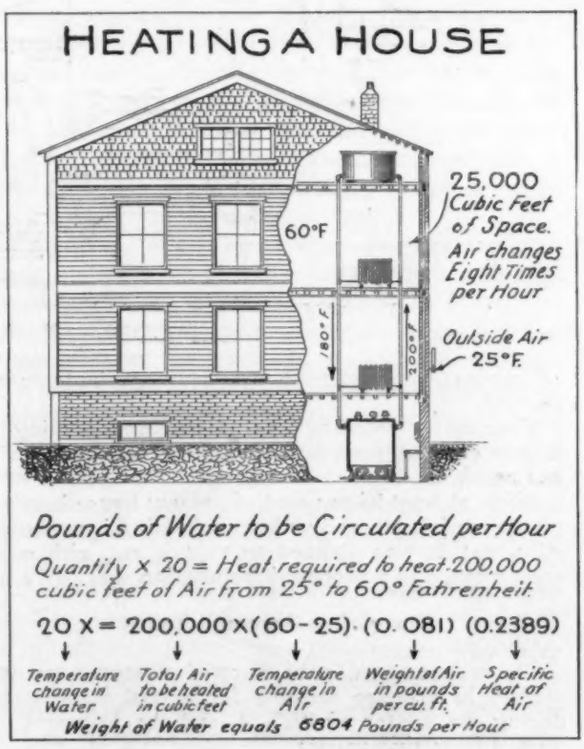
In order to be able to solve this equation it is necessary to know the specific heat of air at constant volume, for the volume remains the same. This is found to be 0.2389. It is also necessary to know the weight of air per cubic foot. This is 0.081 pounds. The equation will then read as follows, assuming that x is the unknown quantity of water:

$20x = (200{,}000)\ (60 - 25)\ (0.081)\ (0.2389)$, or x is equal to 6,804 pounds of water.

Conclusion

This finishes the discussion of that part of the Industrial Gas Lessons which has to do with the effects of heat on substances, which may be either solid, liquid or gaseous in form, but which do not change their condition or state during the time that they are subjected to heat. In other words, it must be borne in mind that up to the present state we have discussed changes in matter brought about by heat which have not resulted in a solid becoming a liquid or a liquid a gas, or vice versa.

In this part of the Industrial Gas Lessons an attempt has been made to define all the principles upon which such changes are based, and also to outline the calculations that are involved in determining how great these temperature changes could be when a certain amount of heat was available or how much heat would be required to effect a given change.


HEATING A HOUSE
60°F
180°F
200°F
25,000 Cubic Feet of Space. Air changes Eight Times per Hour
Outside Air 25°F
Pounds of Water to be Circulated per Hour
Quantity × 20 = Heat required to heat 200,000 cubic feet of Air from 25° to 60° Fahrenheit
20 X = 200,000 X (60-25) (0.081) (0.2389)
Temperature change in Water
Total Air to be heated in cubic feet
Temperature change in Air
Weight of Air in pounds per cu. ft.
Specific Heat of Air
Weight of Water equals 6804 Pounds per Hour

More House Heating*

A review of some work in this field

Joseph Lucena

THIS paper is presented as an abstracted composite of the papers by Mr. G. I. Vincent, read before the American Gas Association, at the 1923 and 1924 annual conventions, entitled "This House Heating Business" and "More House Heating."

In the first paper predictions were made that:

First, house heating will come to the industry in spite of anything done to discourage it.

Second, house heating may only be accepted on an equitable rate basis, in which each class of customer will pay his fair share of the cost of the service.

Third, except in new buildings, installation costs would be prohibitive, unless some economical method of converting existing house heating plants were devised.

Fourth, by reducing heat losses and making a highly efficient installation, the gas demand would not be high.

Fifth, at least 95 per cent of present house heating plants are hot air, and as hot air heating is undoubtedly best, it was planned to experiment with such equipment, and a proposed installation was outlined.

Story of an Accomplishment

The second paper is the story of what was accomplished in a house selected for a trial installation during the winter of 1923-24, and the following is quoted from that paper:

"The house selected was a standard frame, shingle roof, dwelling.

"Data on the building follows:

Outside dimensions without extensions	28x28 ft.
Eight rooms and bath—cubical contents of first and second floors	12,242 cu. ft.
Cubical contents of basement	5,184 cu. ft.
Total side wall exposure above ground, including glass	2,784 sq. ft.
Area of glass exposure of first and second floors	670 sq. ft.
Area of glass exposure of basement	108 sq. ft.
Roof area	1,270 sq. ft.

"Double doors and windows provided throughout, including basement.

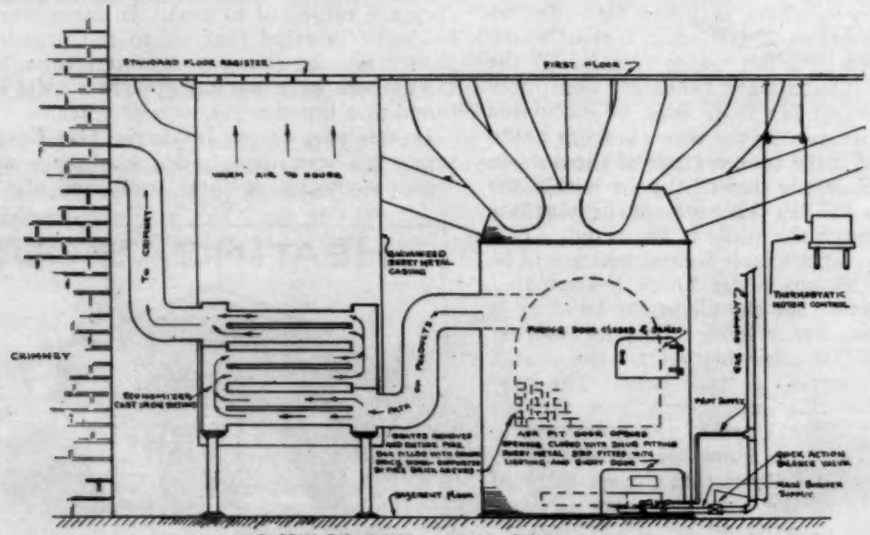


DIAGRAM FOR HOUSE HEATING BY GAS USING CONVERTED COAL HOT AIR FURNACE WITH ECONOMIZER.

"Ceiling of second floor insulated by laying an additional attic floor over hair felt between impregnated paper.

"Briefly, the furnace modification was as follows:

The Furnace Modification

"The grates were removed from the furnace and cast iron bars installed carrying checker fire brick which filled the entire heating space. A triplex burner was installed on the floor of the ash pit, the three parts burning respectively 40, 80 and 120 cubic feet per hour. The header supplying these burners was controlled by a balanced valve operated by a thermostat of the usual dwelling heat regulator type. Between the furnace and the chimney the

*Read at the mid-year meeting of the Pennsylvania Gas Association, December 9, 1924.

(Continued on page 216)

As The Journal Views It

WHO STANDS THE COST?

The more one studies the industrial phase of the gas industry, the more one delves into the various factors that control and influence it, the more apparent it becomes that this part of our industry is one of considerable complexity, possessing characteristics entirely peculiar to itself. In fact, it seems that industrial gas is a business within a business. The men who engage in it must possess qualities which are not necessary in other gas men, and the problems that concern industrial gas are of a character that mark out this phase of our business from all others in a peculiarly emphatic manner.

Thus, for example, while it may be held that the gas utility is a monopoly in the domestic field as far as heating is concerned, it is far from being a monopoly in the industrial field. A talk with any industrial salesman will soon convince one of the truth of this statement. Competition for industrial business is severe in most every field of manufacture and the sale of gas for manufacturing purposes is replete with competitive factors just as much as the sale of any other commodity which is not monopolized. Gas must compete with oil, electricity and other fuels, and in order to obtain the ascendency over these, the industrial gas salesman must possess a high degree of salesmanship and technical knowledge.

It is a fact that when gas is introduced into a factory, it must replace some other fuel. The question then arises in the mind of the manufacturer, will gas give the results that are claimed for it? He is naturally reluctant to change his manufacturing process and take a chance with what to him is an unknown quantity. Those manufacturers who are not progressive are apt to refuse to consider the matter at all, while those who are anxious to improve their manufacturing processes, to effect economies not so much by using a cheap fuel as by using a more expensive one more efficiently, will not consent to make the change until they are convinced by actual experiment that gas will do the work.

The manufacturer, therefore, requires an experimental installation to be placed in his plant and tests to be made with it to determine whether the advantages that are claimed for gas are actually obtainable. Then there arises the question—who is to pay for this installation and who is to stand the expense of it in case it fails? The gas industry is fortunate in having connected with it manufacturers of industrial equipment who are progressive and who look far into the future. They are willing to undergo expense in order to prove that their equipment burning gas will give better results in industrial manufacturing processes than those using any other fuel. These manufacturers have shown time and again willingness to conduct experiments on a large scale and to bear the entire burden or a good part of it in proving the adaptability of gas to a particular manufacturing process.

The affair is of three-cornered character. All three parties involved will eventually gain by a successful demonstration of the applicability of gaseous fuel. Not only the manufacturer of the gas-burning equipment, but the gas company and also the man in whose plant it will be introduced, are bound to derive significant advantage from the contemplated change. Thus there should be no hesitancy on the part of any of the three, not only to enter into an agreement to make such experiments, but also to be willing to contribute time, energy and money to the undertaking.

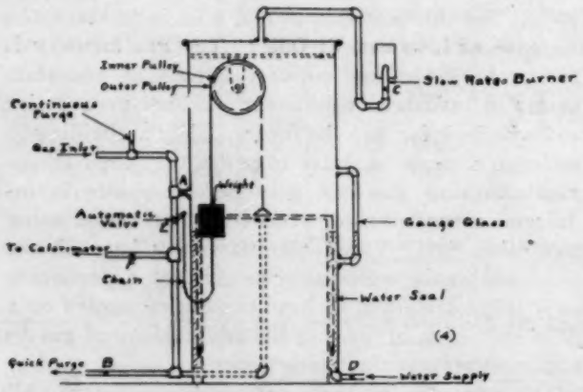
There must be co-operation between these three parties involved in order for gas to make progress as an industrial fuel. There is no reason why there should not be. In the past there have been plenty of cases where such working together of these potent forces have resulted in mutual accumulative benefit. Such co-operation and such combined effort go a long way towards smoothing the difficulties that exist in the path of industrial gas progress. It makes for final success for gas as an industrial field.

GAS WRINKLES

A CONTINUOUS GAS SAMPLING DEVICE

THE continuous gas sampling device, as illustrated, consists of a small enclosed gas holder counterbalanced externally, an automatic shut-off valve, a slow rate burner, gauge glass and necessity pipe lines to a gas service and calorimeter.

The operation of the sampling device is as follows: Line pressure of the gas is first built up in the compartment above the holder or bell by opening valve "A." Valve "A" is then closed. Automatic shut-off valve "E" is opened and gas is permitted to flow into the bell. By the release of pressure above the bell to a slow rate burner through valve "C" the bell rises and a sample of gas is thereby collected. Through adjustment of valve "C" the rate of the rise of the bell may be controlled. As the bell approaches its maximum height the counter balancing weight closes valve "E" and termination of the sampling is complete.



After a gas sample has been collected, line pressure is again exerted on the top of the bell by opening valve "A." Valve "F" to the calorimeter is then opened and the collected gas sample is forced to the calorimeter.

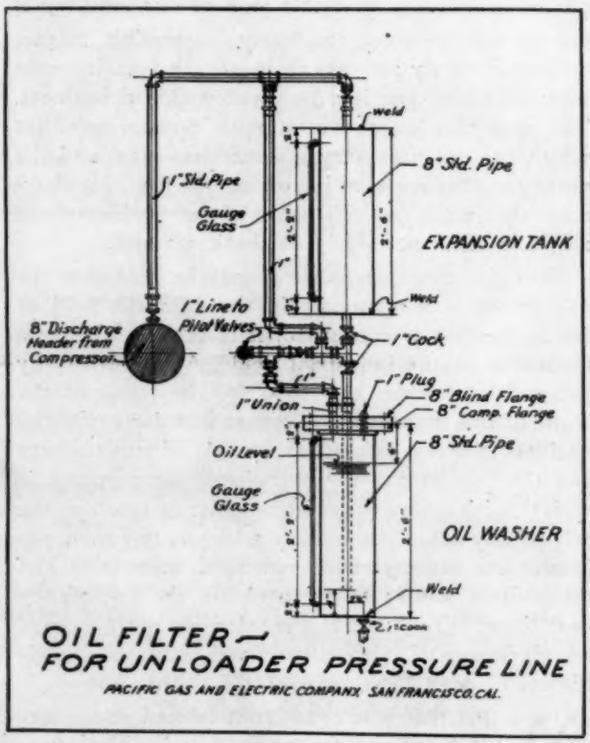
Cart should be taken in the adjustment of the water level in the seal of this device that the pressure exerted above the bell is not sufficient to force water into the pipe line to the calorimeter. Should this occur it may be easily remedied by lowering the water level of the seal.

The outstanding features of this sampling device are, sampled gas is not passed through an orifice; blowing of the seal will not permit gas to escape into the room; temperature conditions of the sample remain constant; a minimum water surface is exposed to the gas sample.

This continuous sampling tank is now being used at gas testing stations of the Pacific Gas and Electric Company in compliance with orders of the California Railroad Commission and has given very satisfactory results.

OIL FILTER FOR PRESSURE LINE TO AUTOMATIC UNLOADER GAS COMPRESSORS

A device designed for the purpose of filtering the gas in the pressure line leading from the high pressure gas header to differential valve for automatic unloaders on compressors used for high pressure gas service, consists of an oil washer, 8 inches diameter by 30 inches in length, an expansion tank of the same dimensions, necessary valves and fittings to connect the tanks in the line or by-pass as desired, and gauge glasses to indicate the oil level in the tanks.

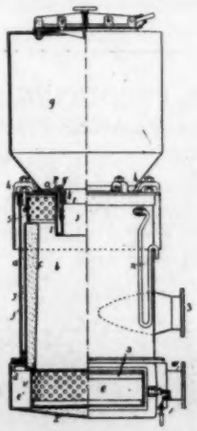


The gas under line pressure passes through the expansion tank, where pulsations are modified so as not to affect the operation of the differential valve, then through the oil filter, where particles of naphthalene, grit, scale, etc., which tend to clog the ports in the differential valve are removed. A small quantity of oil is carried on with the gas in the line, to the differential valve, providing necessary lubrication for this valve.

PROGRESS IN GAS TECHNOLOGY
Domestic and Foreign

GAS PRODUCER

A DOWN draft gas producer is the apparatus which is seen in the accompanying cut and which is patented in United States Patent No. 1,523,163. This producer consists of a detachable refractory-lined fire-box, an ash-pit which supports this fire-box and a removable perforated baffle ring within this ash-pit. Furthermore an exit conduit leads from the ash-pit. An outer shell surrounds the fire-box and also is supported on the ash-pit and forms an annular space between the


(33)

shell and the fire-box. Air is admitted to this annular space. The apparatus is provided with a cylindrical steam generator which is fixed to a cover plate which is mounted on the fire-box. Means are also provided for allowing the vapor to escape from the generator and an overflow pipe from this generator terminates in a siphonic U tube.

A fuel hopper is mounted on the fire-box cover plate and is used for supplying fuel to the firebox.

MELTING-POINT OF COAL ASH

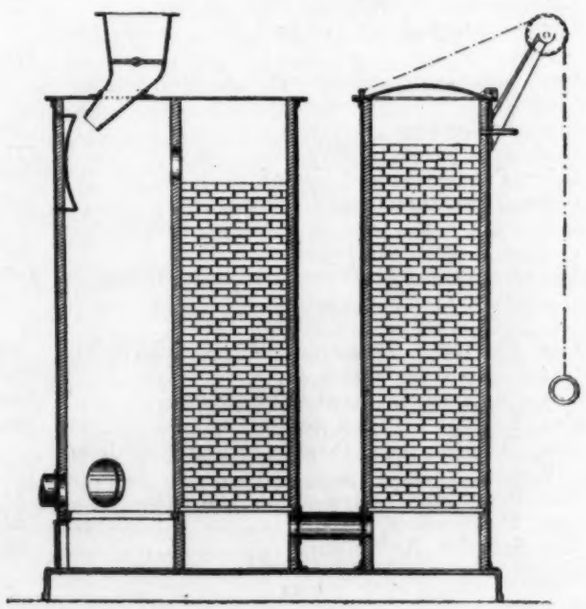
A PAPER was recently delivered at a meeting of the Society of Chemical Industry on the melting-point of ash.

Experiments showed that determinations performed in a reducing atmosphere gave very different results from those obtained in an oxidizing atmosphere; and in this respect a mixture of 50 per cent hydrogen and 50 per cent steam yielded the most pronounced effect, the melting-point being lowered in some cases by as much as 250 degrees C.

This is of importance, in view of the fact that in certain industrial plants—e. g., water gas plants—the coal during combustion is subjected to a reducing atmosphere. It becomes important, therefore, to determine, not merely the melting-point of an ash in air, but the lowest temperature at which an ash will melt as exemplified by a reducing atmosphere. It is common practice to blend coals for certain purposes, and an investigation has been carried out upon the effect of blending coals from the point of view of the melting-point of the ash. Starting with two coals whose ashes melted at different temperatures, it has been shown that, by blending the coals in different proportions, the resulting ash may melt (a) either above the melting-point of both, (b) below both the melting-points, or (c) between the two melting-points.

WATER GAS FROM PULVERIZED COAL

BRITISH Patent No. 224,950 relates to apparatus for use in the manufacture of water gas in which coke, coal, or other carbonaceous matter in a finely-divided condition is subjected to the action of heat in the presence of oxygen and hydrogen. The vessel, through which the carbonaceous matter and the oxygen and hydrogen pass down-



wards, is provided with a deflector against which the coke is projected by a suitable hopper so that it is dispersed. The deflector is so situated that the decomposed steam entering the vessel impinges upon the deflector and meets, at a high velocity and pres-

sure, the carbonaceous matter. Thus the oxygen combines more readily and effectively with the carbon so that carbonic oxide is formed and mixes with the free hydrogen.

The divided coke, coal, or other carbonaceous matter may be subjected to preliminary heating to remove moisture and other volatile matter before being admitted to the vessel. The oxygen and hydrogen are admitted at, or near, the top of the vessel; the steam having been submitted to a temperature usually from 1000 degrees to 1100 degrees C. (but which may be from 950 degrees to 1200 degrees C.). The vessel, as will be seen in the diagram of the plant which we reproduce, may be divided into two vertical parts, in the first of which, by means of a blower, carbonaceous matter is heated to incandescence; the hot gases then passing through the second part of the vessel, and thence into a pre-heater. When the requisite heat is attained, the blowing will be stopped and steam be admitted in the pre-heater, so that it takes up the heat obtained from the incandescent fuel and is decomposed and then passes into the vessel, where it meets the dispersed divided fuel.

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GAS USED IN PRODUCING BEAUTIFUL ABALONE SHELL FLAKES FOR STUCCO WORK

A Monterey, California, inventor has perfected a method for converting abalone shells into beautiful flakes for stucco work. Each year abalone produces a layer of new shell. This inventor treats the shell chemically and then places them into a special gas-heated stove, where they are permitted

The Stove, Showing Gas Burners

to remain for a certain length of time, resulting in the disintegration of the various layers of shell. The shells are then run through a grinder, which flakes them, producing a Roman gold effect which is permanent.

In applying the flakes for stucco work the walls are plastered and then the flakes are inlaid by hand or compressed air into the wet stucco.

Catechism of Central Station Gas Engineering in the United States

Installment No. 60

(Continued from last week)

Ans. The conditions of the problem are such that the only cause operating to produce a difference in pressure between the street main governor and the high part of the district is the difference in elevation between these two points. As the term pressure is used without any qualification, it is understood to carry its commonly accepted meaning of gauge pressure.

According to the answer to question No. 306, the increase in pressure in inches of water that will be shown by a gas lighter than air on account of a difference in elevation between the points of observation, can be determined in any particular case by dividing the difference between the weight of a column of air with an area of one square inch and a height equal to the difference in elevation between the points and that of a column of the gas of the same area and height, by the weight of a cubic inch of water. In this case the columns of air and gas will be 135 ft. or 1,620 in. high and the weight of a cubic inch of air being 0.00004418 lb. the column of air will weigh $1{,}620 \times 0.00004418 = 0.07157$ lb. As the specific gravity of the gas is 0.550, the difference in weight between the columns of air and gas will be 0.45 times the weight of the column of air, or $0.07157 \times 0.45 = 0.32206$ lb. The weight of a cubic inch of water is 0.036 lb., and therefore the increase in pressure between the governor outlet and a point 135 ft. above it will be $\frac{0.032206}{0.036} = 0.894$ in., or practically 9.10, and the pressure at the 135 ft. level will under the given conditions, be 15-10 + 9-10 = 24-10.

What Is Heat?

308. What is heat?

Ans. Heat (in physics) is that specific form of energy, consisting in an agitation of the molecules of matter, which is capable of producing the sensation of heat. It is measured by the total kinetic energy of such agitation.

Heat is now known to be not a substance, but the energy of molecular motion consisting in the case of a gas of nearly uniform rectilinear motions with sudden changes of direction and velocity when the molecules come near enough to one another; in the case of a liquid of irregular wanderings of its molecules; and in the case of a solid of orbital or oscillatory motions. (Century Dictionary.)

Under this theory that heat is the energy due to a form of motion, changes in the temperature of a body are considered to be due to changes in the rapidity of the motion of the molecules, higher temperature being produced by more rapid motion. As the rapidity of such motion increases it gradually overcomes the mutual attraction of the molecules, and solids are thus changed to liquids and liquids to vapors which finally become gases.

Those students who have not already done so should study the subject of Heat carefully in some good work on Physics, such as Ganot's or Deschanel's, while those who care to go into the subject still more fully should take up Tyndall's Heat as a Mode of Motion and Clerk Maxwell's Theory of Heat.

The Heat Unit

309. What is a heat unit? What is the value of a British Thermal Unit and of a Calorie?

Ans. In order to be able to express different quantities of heat in comparable terms it is necessary to have some standard or unit of quantity by which to measure these quantities. Such a standard or unit is called a heat unit.

The British Thermal Unit (B.t.u.), the heat unit most largely used by English-speaking nations, is the amount of heat required to raise the temperature of one avoirdupois pound of pure water one Fahrenheit degree from the temperature of maximum density of water, which is 39.1 deg. Fahrenheit. The variation in the quantity of heat necessary to raise the temperature of a pound of water one degree is so slight for any temperature between 32 deg. and 212 deg., that in general the British Thermal Unit may be safely taken as the amount of heat necessary to raise the temperature of one pound avoirdupois of pure water one degree Fahrenheit. Thus we may say that to raise the temperature of 30 lb. of water from 40 deg. to 60 deg. Fahrenheit requires 600 British Thermal Units; for we have raised 30 lb. of water through 20 deg. of temperature, and to raise 30 lb. of water one degree requires 30 British Thermal Units, and to raise the same quantity 20 deg. requires 20 times as much, or 600 British Thermal Units.

The Calorie

A Calorie, the heat unit used in connection with the metric system of weights and measures, is the amount of heat required to raise the temperature of one kilogramme of water one degree centigrade from the temperature of water at its maximum density, or about 4 deg. C. For the reason stated above

the Calorie may, in ordinary work, be taken to be the amount of heat required to raise, by one degree centigrade, the temperature of a kilogramme of water at any temperature between 0 deg. C and 100 deg. C. Since a kilogramme equals 2.204 lb. and a degree centigrade equals 1.8 deg. Fahrenheit, a Calorie equals $2.204 \times 1.8 = 3.968$ B.t.u.

The Unit of Heat

310. What is mean by a "unit of heat" or "heat unit?" What is the difference between quantity of heat and intensity of heat?

Ans. In order to be able to express various quantities of heat in comparable terms, it is necessary to have a standard unit of heat.

The standard, or "unit of heat" used in this country, is the "British Thermal Unit," and this is the amount of heat required to raise one avoirdupois pound of pure water one Fahrenheit degree in temperature, from the temperature at which water attains its maximum density, which is 39.1 deg. Fahrenheit. The variation in the quantity of heat required to raise the temperature of a pound of water one degree is so slight for any temperature between 32 deg. and 212 deg., that in general the heat unit may be safely taken as the amount of heat required to raise the temperature of one pound avoirdupois of pure water one degree Fahrenheit.

Quantity of Heat

By quantity of heat is meant the total amount of heat possessed by a body or involved in any thermal operation. It depends not only on the temperature or change in temperature, but also upon the weight of the body affected and the capacity for heat of the substance of which this body is composed. Thus a pound of water and a pound of lead at the same temperature contain very different quantities of heat, since the capacity of the lead for heat is only 0.0314 times that of water.

Intensity of heat, or temperature, is entirely independent of quantity, since we may have a small quantity of heat of high intensity, such as the heat in a needle raised to incandescence, or a large quantity of heat of low intensity, such as the heat in a large steel bar at a temperature of, say, 100 deg. Fahrenheit.

All bodies, no matter what their temperature, within the range of temperatures so far obtained, possess a certain quantity of heat, but no body can impart any of the heat that it possesses to another body unless the intensity of this heat is higher than that of the heat in the body to which it is to be imparted, and this is entirely independent of the relative quantities of heat possessed by the two bodies. Thus a cubic foot of water at a temperature of 60 deg. will possess a greater quantity of heat than a cubic foot of lead at a temperature of 100 deg., but if they are brought together the lead will impart heat to the water and not the water to the lead.

Amount of Heat Transferred

The amount of heat that can be transferred between different bodies depends upon the quantity of heat possessed by the hotter bodies, and not merely upon the difference in temperature. Thus a pound of water at a temperature of 70 deg. Fahrenheit can impart more heat to a pound of water at a temperature of 60 deg. Fahrenheit, than can a pound of iron at a temperature of 100 deg. Fahrenheit. From these examples it can be seen that quantity of heat does not depend solely upon intensity, though, of course, for any definite weight of a given substance the quantity of heat possessed will vary directly as the intensity of the heat.

Heat and Gaseous Volume

311. What is the effect of heat upon the volume of any given weight or quantity of gas, and what bearing has this effect upon the question of the maesurement of gas?

Ans. The volume of a given weight of gas, that is, the space occupied by the quantity of gas possessing this weight, is increased when the temperature of the gas increases, and is decreased when the temperature decreases. It has been found by careful and accurate measurement that the exact amount of this increase or decrease is $\frac{1}{273}$ part of the volume of the gas at 0 deg. C. for each change of 1 deg. C. in the temperature. This is equivalent to an increase of $\frac{1}{273 \times 1.8} = \frac{1}{491.4}$ (or as it is usually taken $\frac{1}{492}$) part of the volume of 32 deg. F. for each change of 1 deg. F. in the temperature of the gas. The rule is sometimes given approximately as being, that the volume increases 1 per cent of the original volume for each increase of 5 deg. F. in the temperature, the original volume being measured at the temperature, whatever it may be, that it may happen to possess. But for accurate work it is necessary to remember that the increase in volume for an increase in temperature of 1 deg. F. is not the $\frac{1}{491.4}$ part of the volume at any temperature, but only that part of the volume at 32 deg. F. It must also be borne in mind that this rule applies only to dry gas, that is, gas perfectly free from moisture.

Since according to the above law the same weight or quantity of gas possesses very different volumes at different temperatures, it follows that in order to obtain proper comparisons between amounts of gas measured under different conditions of temperature, it is necessary to know the temperature at which the gas is measured in each case.

(Sixty-first Installment Next Week)

OIL—THE GAS MAN'S NEXT PROBLEM

(Continued from page 202)

which must in some way be met, we may well expect that in 1925 the ratio of gasoline production to fuel oil production from crude will rise to 72 per cent; in 1926, to 78 per cent, and in 1927, to 85 per cent. So, although more and more gasoline is needed, the actual production of fuel oil will probably increase very little over present volumes. Table 3 shows this estimated relationship; assuming that the exports of gasoline will be balanced by "casing-head" (or natural gas) gasoline production:

Table 3

Estimated Production of Fuel Oil and Gasoline

	Gasoline Needed,			Resulting Production, Fuel Oil,
Year	Probable Auto Registration	Million Gallons	Ratio G. to F.	Million Gallons
1924	17,750,000	8,960	67%	13,460
1925	20,250,000	10,125	72%	14,050
1926	22,700,000	11,350	78%	14,550
1927	25,000,000	12,500	85%	14,700

Against this production we must balance our estimated consumption of fuel oil, two-thirds of which is now in competition with coal, and all of which bye-and-bye will come into actual competition with gasoline.

Effect of Increased Prices

Let us compare the prices for coal and fuel oil since the war. Of course, freight charges complicate matters somewhat, but the main factors are indicated by Tables 4 and 5.

Table 4

Average Prices of Coal and Fuel Oil

	One Ton of Coal			4 bbls. fuel oil at refinery*
Year	N. Riv. Coal f. o. b. Cincinnati	Pocohontas f. o. b. Hampton Rds.	Buckwheat at the mines ("Company" Prices)	
1918	$4.10	$4.48	....	$8.04
1919	4.54	4.91	....	6.36
1920	6.29	6.29	....	11.16
1921	5.51	6.35	....	5.20
1922	5.62	6.32	$3.63	4.96
1923	5.72	5.83	3.77	4.80
1924	3.57	4.52	3.18	4.80

Table 5

The Uses of Gas and Fuel Oil—Million Gallons

Year	Gas Works	Elec. Plants	Steamship Bunker Fuel(1)	Excess Exports over Imports	Other Uses(2)	T'tl.
1918	?	?	?	1,245	?	7,241
1919	882	464	590	692	4,944	7,572
1920	870	552	1,106	927	5,283	8,738
1921	841	506	1,137	952	5,734	9,170
1922	856	554	1,332	652	7,338	10,732
1923	910	616	1,576	986	7,876	11,964
1924*	930	710	1,785	1,150	8,725	13,300

Note: *Four barrels of oil are usually taken to equal a ton of coal in fuel value.

From 1918 to 1921, while oil was dearer than coal, its use increased on the average only 650 million gallons per year; since 1921, when oil has been cheaper than coal, its increase has averaged twice that amount.

It is interesting to note the small amount taken by gas works in comparison with all other uses.

Evidently, unless drastic increases in prices of fuel oil take place, the total domestic and export demand will rise this year to nearly 15 billion gallons, which will be more than our estimated production. Assuming a continuation of the present tendencies, therefore, a continuously growing deficiency in supplies must inevitably result.

The Deficiency in Future Oil Supplies

The actual amount of this rise in price cannot be definitely forecasted. The diagram of Figure 3 shows an estimated deficiency this year of 600 million gallons between production and use, and of 1,600 millions in 1926. On January 1, 1925, the surplus stocks, built up through many years of excess production, stood at 1,671 million gallons. Evidently, this surplus will be largely eaten into during the next two years.

A deficiency of 1,600 million gallons between supply and demand is about 10 per cent. We cannot estimate the corresponding effect on the price, but we can point to the grain market, where a 10 per cent deficiency in the world's supply of wheat has doubled its price within the last six months amid great excitement and quite regardless of a substantial "carry-over" from last year.

Effects of Oil Price Increases

In the last analysis, the limits to the profitable use of oil are determined by the price of its substitutes. There is a fundamental law of business—which should be posted above the door of every rate-maker's office and should be memorized by every industrial gas man, that "the market value of any commodity or any service is limited by the price at which a satisfactory substitute can be produced and sold."

A little figuring will show that a 50 per cent increase over the present price of oil to the consumer will very effectively put the brakes on new burners, while a doubling in cost will make it more advantageous for most users to return to coal. A large ship operator recently stated that when the cost of his fuel oil doubles to 10c a gallon, he can more profitably use coal at $5 a ton. An actual test in Minnesota showed that 130 gallons of oil were

Notes: *Estimated; subject to revision.
(1) Ocean vessels; loaded at U. S. ports.
(2) Mostly for steam raising and house-heating purposes.

equivalent for house-heating purposes to burning a short ton of anthracite. On $16 coal, this balances 12½c oil.

The "flight of oil" will thus depend to some extent upon the price of the fuels with which it competes.

The Probable Course of Coal Prices

With respect to anthracite, the future is not entirely clear. Fuel oil competes largely with the smaller or "steam" sizes of hard coal for power purposes; with the larger, or "domestic," sizes for house heating. The market price of pea and the buckwheats is governed to a large extent by that of bituminous. Every indication now on the horizon points, however, to a continued rise in the price of the "domestic" grades of anthracite. The wage agreement between the miners and the operators expires on the 31st of next August, and, while the future is still on the lap of the gods, we may well take note of the tremendous unrest among the workers of the hard coal country.

While the use of oil for house-heating may sound large, it is still, however, insignificant in comparison with the eight billion gallons sold in competition with coal for steam-making purposes. It is, therefore, evident that we get back to the subject of bituminous coal and that it is its price which will govern that of fuel oil.

Bituminous Coal

A small rise in the price of bituminous appears inevitable—not immediately, but within a measurable period; because the coal industry cannot continue to operate very much longer as it did in 1924. Last year was, as stated by its leading trade journal, the worst which the industry has faced in a generation. The average price at which coal is selling, f. o. b., is $1.50.

It is evident, therefore, that, assuming normal business conditions, a small increase in coal prices is very probable. A dollar's difference in anthracite or half that in bituminous is, however, still equivalent to less than a cent per gallon in fuel oil. This margin is negligible when compared with the doubling of oil's present cost—which we may confidently expect to see.

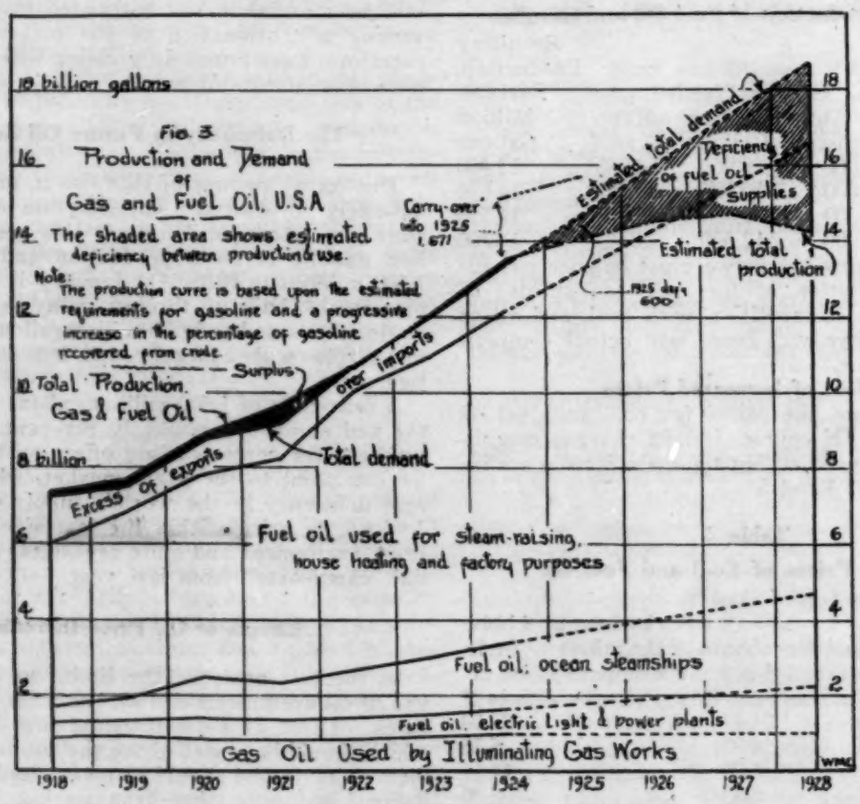
Fig. 3
Production and Demand of Gas and Fuel Oil, U.S.A.
The shaded area shows estimated deficiency between production & use.
Note: The production curve is based upon the estimated requirements for gasoline and a progressive increase in the percentage of gasoline recovered from crude.
Carry-over into 1925 1,671
Estimated total demand
Deficiency of fuel oil supplies
Estimated total production
1925 day's 600
Total Production Gas & Fuel Oil
Surplus over imports
Total demand
Excess of exports
Fuel oil used for steam-raising, house heating and factory purposes
Fuel oil: ocean steamships
Fuel oil: electric light & power plants
Gas Oil Used by Illuminating Gas Works
billion gallons
1918 1919 1920 1921 1922 1923 1924 1925 1926 1927 1928

Fig. 3—Production and Demand of Gas and Fuel Oil

Possible Use of Crude Oil for Gas Enrichment

The question naturally arises whether it is not possible to avoid the increased cost of gas oil by the direct use of crude for the enrichment of water gas. Its use in the manufacture of oil gas is entirely feasible and many plants located in oil producing territories appear to be doing it with success. There seems to be serious doubt, however, as to the degree of economy which would attend its promiscuous use

by water-gas works located at a distance from the source of petroleum supplies.

Heavy oils have little viscosity; most have a relatively high coke content which soon plugs the ordinary carburettor with carbon, and many of them contain a large amount of sulphur. While 12-15 Be' Mexican crude has successfully been used in the East in water-gas sets especially designed for the purpose,* it has been found that the high organic sulphur content of the resultant gas has occasionally been very troublesome. In addition, there must always be borne in mind the following: that while fuel oil can be counted upon to maintain, within limits, certain general physical characteristics, this is impossible with crude. All producing fields—and sometimes even individual wells in the same field—are chemically and physically different from any others. There is no such thing as a standard formula for crude. Thus there results the obstacle of the necessity for frequent changes in gas-making operations as the source of crude supplies may unavoidably shift. This entire subject is at present being studied by the Water Gas Committee of the American Gas Association, and its report, this fall, is awaited with much interest.

The Problem of Future Supplies of Crude

The second, and more important, aspect of the matter is concerned with the probable extent of the recoverable crude oil deposits of this country. This will affect the price of the raw material, entirely apart from the question of the comparative yields of its products. The problem of future supply is the most acute of any which lie ahead, and its results on the economic life of this country cannot be overestimated. Little imagination is necessary to picture the effect on transportation and on the automotive industry of a demand for cars curtailed by soaring prices for gasoline; of that on steamships, power plants and factories by even a moderate rise in the price of fuel oil.

This much we know: that the demand for oil products is not only growing, but growing at a furious rate. The entire output of the State of Pennsylvania since Drake's well in 1859 to this day —even if it could have been torn from the earth in one year—would not have sufficed to meet last year's demand.

Note that two and one-quarter million barrels every 24 hours now used in this country depend on continuously finding and keeping going at least seven bonanza pools equivalent to the maximum Powell production (356,000 barrels), and then reflect upon what slender strings of chance the future of this industry hangs.

Oil Shales

From time to time we hear something from our professional optimist about oil shales and their ultimate replacement of the liquid crude. There are enormous beds of this in Colorado, Wyoming and Utah; enough to supply the demand for years to come. But there are also many serious obstacles in the way of its successful use. The cost of mining is enormous, as many of the best beds lie buried deep under other rocks. Only one barrel of oil can be recovered from a ton of shale, and its cost is usually estimated at from $20 to $40 per barrel—or from 50 cents to $1 a gallon. There is more oil than this recoverable, at far lower cost, in a ton of ordinary bituminous gas-coal. In addition to this, no stretch of the imagination can visualize the simultaneous mining and distilling of the 750 million tons of stone necessary to supply a year's demand for crude—a mountain each year nearly equal in volume to the earth moved in building the Panama Canal—to say nothing of the successful removal of the waste after it has gone through the stills.

Conclusions

1. Regardless of the question of the continuation of future supplies of crude, a rise in the price of fuel and gas oil is inevitable and may reach considerable heights before it puts an effective brake on the demand.

2. While the reorganization of the water-gas processes to use the crude directly is possible and will obviate the necessity for the payment of higher prices for gas oil, this step will introduce for the ordinary gas company other problems of still undetermined extent which may or may not make the change justifiable. In any case, it will not help in case of a rise in the price of the crude itself.

3. No matter what oil is used, the question of the indefinite continuation of future supplies of crude is extremely uncertain. The present balance of probabilities points to a great rise in its price as soon as the present era of furious over-production dies down and the oil industry rights itself once more.

4. Increased cost of oil will mean that the gas companies must either raise their rates accordingly; or must cut down the B.t.u. content of their product; or must get away from the use of oil altogether by turning to other types of gas manufacture. It is very seriously recommended that the industry should inquire into the possibilities of the various plans whereby oil can be recovered from coal during distillation, with a view toward combining the manufacture of gas, the recovery of oil and the production of coke into one economical process.

5. Increased cost of oil will cause many of its present users to abandon it for other fuels. Coal has its dirt, labor and inconveniences, and the former oil consumer will not go back to it if he can find something else. This will be a golden opportunity for industrial gas—provided that the price is reasonable and that a correct rate structure can be developed.

THE BATTLE FOR HEATING BUSINESS

(Continued from page 200)

A Research Department

This is just the plain ordinary truth of the matter. If you are going to keep on tolerating this condition, you are going to be forced to take an alternative which will cost you more money. The best way that I know of to develop this industrial gas business is for every one of you to dig down in your pockets and make an appropriation large enough to justify a Research Department, that is a Research and Development Company, or a department of the association to develop this much-needed equipment.

Electricity Will Take the Business if Gas Does Not

The years are rolling by while our development work is remaining practically stationary. Your companies are dealing with great dynamic forces The General Electric Company and the Westinghouse Company are spending millions of dollars and obtaining the best talent available for this work. The statements of some of their leaders make us feel that we do not exist. They have surveyed every single industry; they know the potential possibilities in the way of KW consumption, the maximum revenue to be derived from that source and the amo of capital necessary to build plants to carry the loa They have the whole situation lined up for years to come and believe they have the problem solved. What is the psychology of this?—simply that the believe the gas business is dead and they must pre pare to take on the entire load.

There is very little to say about competition from isolated plants, because if a plant of this kind can compete with you only as long as your service is poor or you rate schedule bad. If these factors are all right, your relationship with the isolated pl is as that of the electrical company to the large power users. I might supplement this statement by saying that any advantage in price that may come from the use of producer gas is entirely offset by its lack of efficiency as compared with city gas.

MORE HOUSE HEATING

(Continued from page 206)

economizer was installed. In this device the products of combustion passed through cast iron wall radiators on the way to the chimney, the banks of radiators being enclosed by galvanized steel casing

so that cold air from the basement floor flowed around the radiators and out through one large register near the center of the house. The cold air inlet to the furnace was removed and cold air openings made at the four corners of the first floor and a larger opening at the foot of the stairway. Therefore, all cold air drained from the first floor into the basement with no drafts.

The Burners

"The burners were selected so that there could be six possible rates per hour, i. e., 40, 80, 120, 160, 200 and 240 cubic feet. With exception of short experimental periods, only the 120 or the 200 combination was used. At no time was more than 200 cubic feet per hour required.

"Automatic humidifying equipment was installed.

"Full recording instrument equipment gave all data.

"Gas was 537 B.t.u. manufactured gas.

"The thermostatic control was set to maintain the house temperature from 5 a. m. to 10 p. m. at 10 deg. F., and from 10 p. m. to 5 a. m., at 65 deg. F.

Results

During the coldest weather, when the 200 cu. ft. per hour combination was used, the mean stack temperature was 88.6 deg. F. When the 120 cu. ft. combination was used, the mean stack temperature was 84.1 deg. F. In both cases the calculated overall efficiency was over 97 per cent. The coldest day was January 27, 1924, which reached a minimum of minus 15 deg. F., with a mean during twenty-four hour of minus 40 deg. F. On one other day the mean temperature was just zero, with an average wind velocity of 40 miles per hour, which was a more severe day than the day with a lower temperature. On each of these days the demand of 200 cu. ft. per hour carried the load with entire satisfaction, there being a margin of nearly 100 per cent. That is, only a little more than half of 4,800 cubic feet per day was burned."

Comparison with Coal

Curiously, the heating with coal by the same furnace left much to be desired in severe weather, while with gas there was a marked improvement, which may be attributed wholly to the improved circulation. With coal the heat from the registers was intense, but in order to be comfortable one must remain close to a register. With gas, the heat from the registers was so mild as to be scarcely noticeable, yet the rooms were comfortable at any point.

The design of the installation outlined in the first paper was closely followed, with some features discarded after trial as unnecessary. These were the damper to the cold air furnace inlet, the flue by-pass around the economizer and the thermostatic control of the stack temperatures.

That it is possible to convert any existing coal-burning house heating plant to burn gas and that the hourly gas demand may be held within practical limits appears to be proven.

NEWS OF THE GAS INDUSTRY

Illinois Gas Association Meets March 18-19 in Chicago

The following program will be presented at the annual meeting of the Illinois Gas Association in the Fifth Joint Convention of the three Illinois utility associations:

Joint Morning Session, Wednesday, March 18, 1925

10 o'clock—Meeting called to order and opening remarks by President Bert H. Peck.

Secretary-treasurer's report.

Appointment of convention committees.

Address—"Manager's Privileges and Responsibilities," Allen T. Early, district manager, Illinois Power & Light Corporation, Collinsville, Ill.

Address—"Selling the Company to Its Employees," Paul W. Herring, assistant to vice-president, The Peoples Gas Light & Coke Company, Chicago, Ill.

Address—"The Future of Electric Railways," J. P. Barnes, president, Louisville Railway Company, Louisville, Ky.

Address—"The Utility Business from an Editor's Viewpoint," Verne Joy, publisher, Evening Sentinel, Centralia, Ill.

12:30 noon—Group luncheon. Tables arranged for executives, superintendents, accountants, engineers, metermen, etc.

7:00 p. m.—Banquet.

Joint Morning Session, Thursday, March 19, 1925

10 a. m.—Meeting called to order and opening remarks by President John G. Learned.

"Illinois Committee on Public Utility Information Work for the Year," John F. Gilchrist, chairman.

"Talk Relative to Work of the Committee on Co-operation with Educational Institutions," Britton I. Budd, chairman. Discussion: Dean Heilman, of Northwestern University; Dean Thompson, of University of Illinois.

"Education of Employees and the Necescsity of a Definite Program in Each Company," B. J. Mullaney, Peoples Gas Light & Coke Company, Chicago (also chairman employees' educational committee of the American Gas Association).

"Work of the District Speakers' Organizations," George R. Jones, chairman of the Central Speakers' Bureau Committee.

"Reports of the Ten District Chairmen on the Work of Their Districts": J. H. Corcoran, L. C. Stephens, R. F. Carley, George C. Treadway, J. E. Johnson, J. Paul Clayton, Bert H. Peck, J. H. Conrath, John S. Reesman, E. R. Cooper.

Gas Section
Wednesday Afternoon, 1:30, March 18, 1925 (Tiger Room)

"Why Gas Companies Should Secure Industrial Business," by Committee of Illinois Gas Engineers," G. H. Hirschfeld, Chicago; C. H. Kallstedt, Evanston; F. F. Cauley, Chicago (chairman).

"Relations with Architects," William A. Adams, the Peoples Gas Light & Coke Company, Chicago.

"Information Available Through the American Gas Association," J. M. Roberts, vice-chairman, Committee on State Representation, American Gas Association.

"Cost Analysis in Securing New Business," P. J. Naschold, Rockford Gas Company, Rockford.

"Use of Small Trenching Machines," illustrated with moving pictures, A. G. Ford, Western United Gas & Electric Co., Aurora.

Thursday Afternoon, 1:30, March 19, 1925 (Tiger Room)

"Hot Water in the Home," Glenn C. Carnahan, the Peoples Gas Light & Coke Company, Chicago.

J. H. Taussig Dies; U. G. I. Gas Engineer

John Hawley Taussig, gas engineer of the U. G. I. Contracting Company, inventor of gas-making apparatus, and in the late nineties a famous Cornell football player, died yesterday at the Chestnut Hill Hospital, Philadelphia, where he had been ill for a short time.

Mr. Taussig, who was 49 years old, lived with his wife and three children on East Gravers Lane, Chestnut Hill.

J. H. Taussig

He was a son of the late Rear Admiral Edward David Taussig, U. S. N., and a brother of Captain Joseph K. Taussig, U. S. N., a member of the War College at Newport, R. I. Another brother is Charles A. Taussig, of New York City.

Following his graduation from Cornell in 1897, he was in the engineering department of the Philadelphia Gas Works for three years. Then he went to Newark, N. J., as superintendent of the Market Street Gas Works, but three years later returned to this city as assistant engineer of tests

with the U. G. I. He had been with that corporation since. A few years ago he was recipient of the Edward Longstreth medal awarded for his inventions in gas apparatus, by the Franklin Institute.

In 1905 Mr. Taussig married Miss Meredith Ball, daughter of Mr. and Mrs. Robert H. Ball.

He was a member of the American Society of Mechanical Engineers, the American Gas Association, the Natural Gas Association, the Illinois Gas Association and the Franklin Institute. He was also a member of the Philadelphia Cricket Club, the University Club, the Cornell Club and the Delta Upsilon Fraternity.

N. Indiana G. & E. Co. Reports Business Increase

Substantial increase of the business of the Northern Indiana Gas & Electric Company during 1924 is shown by the annual report of the company.

The operating revenue of the company in 1924 totaled $8,105,950.34, compared with $7,624,883.82 in 1923, an increase of $481,066.52. Net income of the company totaled $1,893,177.64 for the year, compared with $1,354,429.05 in 1923, an increase of $538,748.59.

There was a material increase in the number of customers in the 36 communities served by the company and sales of both gas and electricity showed a good increase over the preceding year. The company added during the year 9,124 new gas customers, bringing the total number of customers supplied with gas service up to 100,985. New electric customers added during the year totaled 4,793, making a total of 37,809 customers receiving electric service at the end of the year.

Announcement was also made that sales of gas totaled 3,651,267,000 cubic feet during 1924, compared with 3,257,224,500 cubic feet of gas sold in 1923.

The report shows a balance of $351,419.33 after the payment of dividends. This balance will be added to the surplus account of the company and will be used for improvements and betterments, thus increasing the investment and strengthening the position of the stock of the company, which is now owned by over 10,000 stockholders, including a large number of customers who have invested in the company's 7 per cent preferred shares.

The Bartlett Hayward Co. Sold to the McClintic-Marshall Construction Co.

It is announced that The Bartlett Hayward Company, Baltimore, Md., has been purchased by the McClintic-Marshall Construction Company of Pittsburgh, Pa. Announcement was made by Mr. Howard Bruce, of The Bartlett Hayward Company.

Building New Plant at Louisville, Kentucky

The Hoffman Heater Company Lorain, Ohio, has purchased a six-acre tract of land at 18th and Hill streets, Louisville, Ky. A new modern factory of brick and steel construction, 100x450 feet, with two-story office building, is now under construction and expected to be completed by May 15. The new factory will be equipped with new labor saving devices and machinery. The general office of the company will be located at the St. Louis plant in the early fall.

Wisconsin Utilities Association Meets—Good Attendance at Gas Section

The gas section met February 26 and 27.

The attendance was 125.

This was the first meeting since the consolidation of Wisconsin associations, devoted exclusively to technical gas problems. Not only the most successful meeting of gas men ever held in the state, but the most fully attended and productive of the most extensive exchange of ideas, experience and costs.

New officers elected were: S. B. Sherman, general gas superintendent, Wisconsin Gas & Electric Company, Racine, chairman; George E. Wagner, general superintendent, Madison Gas & Electric Company, Madison, vice-chairman.

The program carried out as printed in the American Gas Journal, except that Mr. Rahn's paper was read by Mr. John T. Mason of Milwaukee and Mr. Wortendyke's paper was read by Mr. H. R. Broker of Racine. A report was also made by the Coke Committee, William C. Butterworth chairman.

Own Your Home Movement in Buffalo

Buffalo, N. Y.—The Gas Appliance Committee of the Buffalo First Annual "Own Your Home" Exposition is being organized under the classification of the gas industry as prepared by the exposition management and edited by the American Gas Association. This classification covers all the equipment and appliances used in the modern home, and Lucius S. Bigelow, publisher of the Gas Industries Magazine, chairman of the Buffalo Exposition Gas Appliance Committee, is appointing prominent members of the trade to represent each division listed.

The classification that is being used as a guide in presenting more balanced expositions in Chicago, New York City and Philadelphia, as well as in Buffalo, includes: Domestic Stoves and Ranges (gas ranges, combination gas and coal ranges, combination gas and electric ranges and laundry stoves); Tank Water Heater, Automatic Water Heaters (instantaneous type, storage type); Domestic Heating Stoves (gas-fired steam radiators, gas-fired hot air radiators, fires of the reflector type, cylinder heaters, fires of the radiant type, gas logs and gas garage heaters); Gas-Fired House Heating Boilers; Gas-Fired Incinerators; Gas Lighting (fixtures and burners); Gas Irons; Laundry Equipment (gas dryers, gas-heated ironing machines and gas-heated washing machines).

Henry S. Norris, Iroquois Gas Company, was appointed vice-chairman of the committee, and representative on the publicity committee; Irving R. Brown, Welsbach

Company, secretary, and the chairman was authorized to make additional appointments in accordance with the classification.

The other members of the committee include: G. L. Bossman, Pittsburgh Water Heater Company; G. J. Buchauer, J. N. Adam & Co.; Felix J. McTernan, Minneapolis Heat Regulator Company; James F. Magee, James Clow & Sons; J. A. Sullivan, Wise Furnace Company; N. M. Adema, Pennsylvania Furnace & Stove Company, and Peter Parsons, Walbridge & Co.

Meters More Accurate Than Watches

C. E. Paige Talks About Gas in Brooklyn, N. Y.

"To persons who complain that their gas meters are wrong," says Clifford E. Paige, vice-president of the Brooklyn Union Gas Company, "I should like to say that any one who takes 100 gas meters and 100 watches and uses them for six months would find, at the end of that time the meters more accurate than the watches."

He says: "We know in the Brooklyn Union Gas Company what a reliable and stable public servant gas is. Turned on in Brooklyn about 75 years ago, its service has never been discontinued. As to the meter, its fundamental principle was utilized way back in 1848, and while its application has been improved, the basic principle's reliability has never varied.

Pipe Called "Service"

"It is interesting to note that when gas was first introduced, the pipe from the street to the house was called 'the service,' and from that usage of the term the word first came into vogue. Now service is increasingly a factor in every industry, though especially in a public utility like gas. We hate to use the word, for often it seems these days to be advertising jargon, but in point of fact it is an aim of ours to give it, and there is no satisfaction that I myself feel so greatly as that when I realize that we do give high service all the time.

"The 5,100 employees on the company's roster are taught to realize the value to us and to themselves of consumer satisfaction. Meetings are held regularly of all heads of departments, at which problems are discussed and methods of improving the consumer's satisfaction are debated and worked out. We train our employees in the belief that they have an obligation to the company's customers, that as public servants they should give customers, without discrimination of any kind, the fair, respectful and courteous treatment to which they are entitled. If I were called upon to characterize the Brooklyn Union Gas Company I would call it an organization which is continuously trying to attain the ideal of satisfaction to the consumer at a reasonable rate.

Watch for Changes

"There are two interesting ways in which the company serves the public that perhaps are not generally known. One is that we encourage complaint, discussion and negotiations with the consumer before anything is unsatisfactory, rather than wait for something to go wrong. The other way is to keep informed as to impending changes in streets, such as repaving, so that we may dig up the old street and get everything fixed before new paving is laid.

"The consumer has almost an ownership interest in public utilities, since the stock is so largely in the possession of insurance companies, and a great many people pay some kind of insurance. The whole problem of public and private welfare is linked together.

Growth of the Business

"In the minds of the uninformed there is the impression that the gas business is on the wane. As a matter of fact. the amount of gas still used for lighting purposes is much as it was 30 years ago. But in 1922-23, for instance, the total amount of gas used for household purposes alone, including cooking, was greater than the total sales of 30 years ago. Increase in use of gas is at a rate of 10 per cent a year. Households use about 58 per cent of it for purposes other than lighting, 20 per cent is utilized for illumination and 22 per cent for other purposes, mainly industrial. There are today 4,000 different industrial uses for gas. The movement in this direction began about 15 years ago with the practical application to industry of the bunsen burner's principle. The greatest impetus to the development came in the World War, when all industry was forced to find new ways of being useful."

F. Lewis Marshall Resigns Position

Announcement was made recently by F. Lewis Marshall, for the past ten years manager of the Gas Light Company of Augusta, that he had tendered his resignation to the president of the Southern Gas & Power Company of Philadelphia, owners of the local gas light company. The announcement by Mr. Marshall will come as a great surprise to the general public and even to his close friends.

He had served the company and the public in a manner which has commended him to the people of this community and Augustans ardently hope that Mr. Marshall's severance of his connection with the gas light company will not mean that he will leave Augusta. His resignation will be effective April 3rd. Asked as to his plans, Mr. Marshall said that he had no definite plans, but that he hoped to

make arrangements to continue to live in Augusta, where he and his family have so many friends.

Active in Civic Affairs

The career of Mr. Marshall in the gas light business has been remarkably successful. He has been engaged in it practically all of his business career, starting in Portsmouth, Va., over twenty years ago. He came to Augusta from Richmond, Va., where he built the suburban gas system. Almost immediately upon becoming an Augusta citizen he took an active interest in all civic affairs and after being here for four years was made president of the board of commerce, occupying that responsible position during the year 1918, when innumerable matters had to be handled by the board of commerce affecting Camp Hancock, where between 30,000 and 40,000 soldiers were stationed.

Mr. Marshall was one of the men who did so much to bring Camp Hancock here, and many believe he was more directly responsible than any other man, having been an army man himself at one time and having a wide acquaintanceship with high officers of the army. After the armistice, Mr. Marshall worked ceaselessly to have a government hospital established here and with Col. Sanford H. Cohen did more to bring the Lenwood Hospital into actuality than any other. He is a member of the Augusta Rotary Club, where he is extremely popular. He was twice president of the Southern Gas Association and in 1924 brought the annual convention of the association to Augusta.

Popularized Gas Company

As an evidence of the great growth of the Gas Light Company of Augusta it might be mentioned that the gas consumption has been doubled in this city in the decade in which Mr. Marshall has been manager, reflecting the growth of the city, the increasing popularity of gas as a fuel and the high standing of the company with the public.

The splendid growth of the gas company is evidence of the fact that while Mr. Marshall was intensely interested in civic affairs, as he believes every citizen should be, that the business entrusted to his care continued to thrive through the years and the most recent announcement showing its continued progress and prosperity is to the effect that gas mains are to be built into North Augusta, giving the suburb the benefit of this modern convenience, which is so badly needed.

Recent Incorporations

Albany, N. Y.—American gas & Electric Company, New York City, formed by consolidation of American Gas & Electric Company and Appalachian Securities Corporation with a capital of 2,850,000 shares non par value, of which 600,000 shares are preferred stock and 2,250,000 shares common stock. S. Z. Mitchell, 71 Broadway, Anson W. Burchard, 120 Broadway, and R. E. Breed, 30 Church street, New York City, are the directors and subscribers. Simpson, Thacher & Bartlett, 62 Cedar street, New York City, are attorneys for the corporation.

Chuctanunda Gas Light Company, Amsterdam, has filed a certificate in the office of the Secretary of State increasing its capital stock from 16,000 shares non par value to 40,000 shares non par value.

L. F. Blyler and E. J. Burke Form Firm

L. F. Blyler and E. J. Burke have formed the firm of Burke & Blyler, to merchandise gas appliances such as ranges, heaters, etc., as well as household equipment such as refrigerators, kitchen tables, cooking wares, etc.

The firm has arranged to handle various well known lines such as the C. L. Bryant house-heating boiler, radiant fire heaters, etc.

Contracts Awarded

The Jones & Laughlin Steel Corporation has placed a contract with the Koppers Company covering the design and erection of a complete by-product coke plant at Aliquippa, Pa., to consist of two batteries of 61 Koppers Company's Becker type coke and gas ovens, with the necessary coal and coke handling, by-product and benzol recovery plants. The plant is designed to produce approximately 1,800 tons of blast furnace coke per day.

In addition to the contract which it has already been awarded, the U. G. I. Contracting Company, Philadelphia, has received the order from the Public Service Production Company to furnish and install U. G. I. high duty salt water gas condensers at the new plant in Harrison, N. J. There will be four condensers in the system, of capacity sufficient to handle about 30,000,000 cu. ft. daily. These condensers as designed for the Harrison plant incorporate the efficiency of the fresh water condenser, together with the protection against corrosion due to the use of salt water.

The Queens Borough Gas & Electric Company is preparing to extend the condenser system at its Rockaway Park (N. Y.) plant, and has awarded the contract to the U. G. I. Contracting Company, Philadelphia, for furnishing and installing an additional 8-pass salt water condenser, together with the necessary gas connections, salt water inlet and outlet connections and foundation changes.

The contract also calls upon the U. G. I. Contracting Company to furnish and install two after-coolers, having capacity o f300,000 cu. ft. of gas per hour.

Measure for Lessening Utility Taxation in Albany

Albany, N. Y.—An amendment to section 255 of the Tax Law, introduced in the Senate by Seabury C. Mastick of Westchester county, provides that mortgage of a corporation for refunding debt of prior mortgage on which tax has been paid shall be taxed only on amount of difference between subsequent mortgage and prior debt refunded. This measure will be of interest to all public utility corporations and if enacted into law will go a long way to lessen taxation on reorganizations and refundments.